

SPECIES COMPOSITION, STATUS AND FEEDING ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA¹

K.B. RANAWANA AND C.N.B. BAMBARADENIYA²

(With four text-figures)

Key words: Hakgala Strict Nature Reserve (HSNR), Horton Plains National Park (HPNP), Peak Wilderness Sanctuary (PWS), avifauna, beta diversity, species composition, feeding guilds.

A survey was carried out from May to October 1995, to investigate the species composition, status and feeding ecology of bird communities in three high altitude forests of Sri Lanka, namely Hakgala Strict Nature Reserve (HSNR, 1142 ha), Horton Plains National Park (HPNP, 3160 ha) and the Peak Wilderness Sanctuary (PWS, 22,380 ha). Altogether, 116 species of birds were recorded during this survey, including 13 species of winter migrants and 23 species that are endemic to Sri Lanka. The number of bird species observed at HSNR, HPNP and PWS were 61, 47 and 98 respectively. Results indicate that the avifauna at PWS has a high species richness. Beta diversity measurements also indicate that the avifauna at PWS is more diverse, as compared to HSNR and HPNP, whose avifaunal communities show a higher degree of similarity. Seventeen food defined guilds were identified among the bird species. The fact that 21 species of birds (19.5%) observed during this survey are nationally threatened today, points to the importance of conserving these few remaining high altitude forest patches, thereby ensuring the survival of these vulnerable species.

INTRODUCTION

Sri Lanka, with a varied landscape and a diversity of habitats, harbours a rich bird life. 427 species of birds have been recorded to date from the island, which include 169 winter migrants (Phillips 1978), and 26 endemic species (Wijesinghe 1994). A majority of the endemics are confined to the wet southwestern areas of the island (Wijesinghe *et al.* 1993). Some studies have been carried out previously on the species composition, ecology and status of avifauna especially in the low country wet and dry zones of Sri Lanka (Kotagama and Thambiah 1986, Jansen *et al.* 1986). However, information on the montane zone avifauna of Sri Lanka is scarce. Werner and Schwienfurth (1985) recorded many

species of birds that are endemic to Sri Lanka from two montane zone forests — the Peak Wilderness Sanctuary and Horton Plains.

The present study was carried out in three high elevation wet zone forests of Sri Lanka, namely the Hakgala Strict Nature Reserve (HSNR, 1142 ha), Horton Plains National Park (HPNP, 3160 ha), and the Peak Wilderness Sanctuary (PWS, 22,380 ha). The HSNR (1650 m - 2178 m above msl) lies on the south bank of Sita Eliya and consists of a botanically rich montane cloud forest (IUCN 1990). It also contains some patches of montane grasslands. The HPNP (1800 m - 2289 m above msl), which adjoins the eastern edge of the PWS, comprises of a gently undulating highland plateau which supports wet montane grassland, fringed and interspersed with patches of dense montane cloud forest (IUCN 1990). The PWS (50 m - 2230 m above msl) consists of three major forest

¹Accepted May, 1997

²Department of Zoology, University of Peradeniya, Sri Lanka.

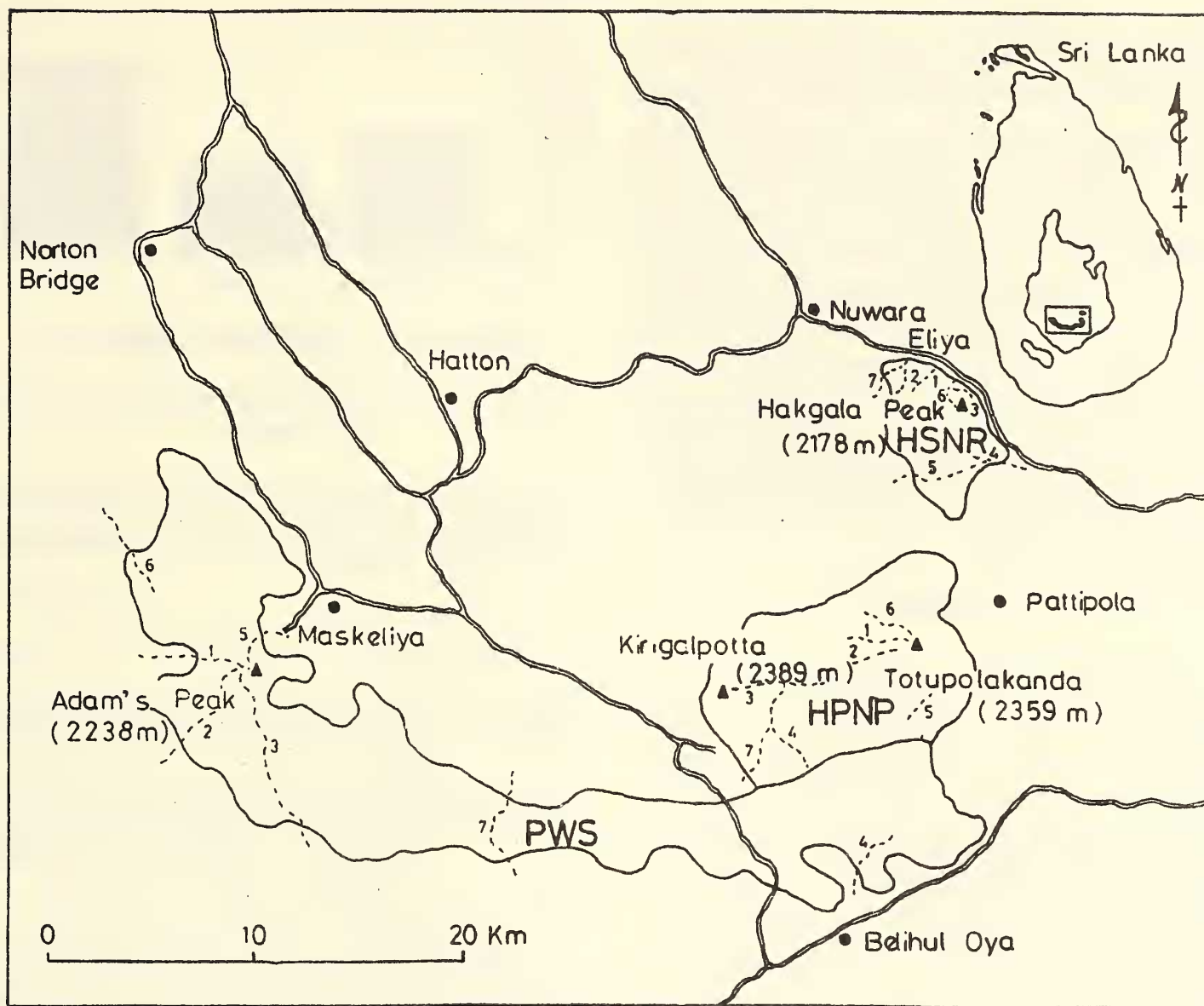


Fig. 1: Map showing the protected areas studied for avian communities

.....	Study trails	HSNR	01	Licence bridge - Seetha Eliya - 2 km
==	Main Road		02	Kande Ela - Seetha Eliya - 1.5 km
~	Forest Boundary		03	Hakgala Botanical gardens border - 1 km
PWS	Peak Wilderness Sanctuary		04	Warwick Estate border - 1 km
HPNP	Horton Plains National Park		05	Ambewela NLDB farm border - 1 km
HSNR	Hakgala Strict Nature Reserve		06	Hakgala Peak trail - 1.5 km
			07	Kande Ela tank border - 1 km
		HPNP	01	Thotupolakande peak trail - 1.5 km
			02	Dayagama Road - 2 km
			03	Kirigalpotta peak trail - 4 km
			04	World's end trail - 1 km
			05	Wet montane grasslands - 1 km
			06	Grassland & forest edge - 1 km
			07	Baker's Falls - 1.5 km
		PWS	01	Eratne-Adam's Peak - 5 km
			02	Palabathdela - Adam's Peak - 8 km
			03	Hapugastenna - Adam's Peak - 7 km
			04	Belihul Oya - Ihala Galagama - 3 km
			05	Moray Estate - Adam's Peak - 4 km
			06	Maliboda - 2 km
			07	Mihiriyakotte-Waleboda - 5 km

formations which are contiguous and altitudinally graded; the lowland rainforest (50 m - 700 m), the sub-montane rainforest (700 m - 1700 m) and the montane cloud forest (>1700 m). All three forests lie within the montane wet zone of Sri Lanka. Details of topography, vegetation and climate of these areas is given in the IUCN Directory of South Asian Protected Areas (1990).

The main objective of the study was to compare the species composition and diversity of bird communities in these three high elevation forests of Sri Lanka, and to study the habitats and feeding ecology of the bird communities in the same three forests.

METHODOLOGY

The study was conducted from May to October 1995. Bird communities in each of the three forests were investigated along seven pre-determined trails respectively (Fig. 1), covering all major habitat types (forests, scrublands, grasslands and aquatic habitats). The length of a single trail varied between 1-8 km (App. I).

Birds were observed from early morning (0600 h) till late evening (1830 h) and approximately 350 man hours were spent at each forest. Identification of the birds was based on Henry (1978) and Kotagama and Fernando (1994). Species nomenclature follows Phillips (1978).

Using the presence/absence data (qualitative data), the degree of change (variation) in species composition between the forests was calculated for each forest, using Whittaker's measure:

$$\beta_w = S/\alpha - 1$$

where S = the total number of species recorded in a forest, and

alpha = mean species richness or mean number of species per trail (Magurran 1988).

The degree of similarity of two forests

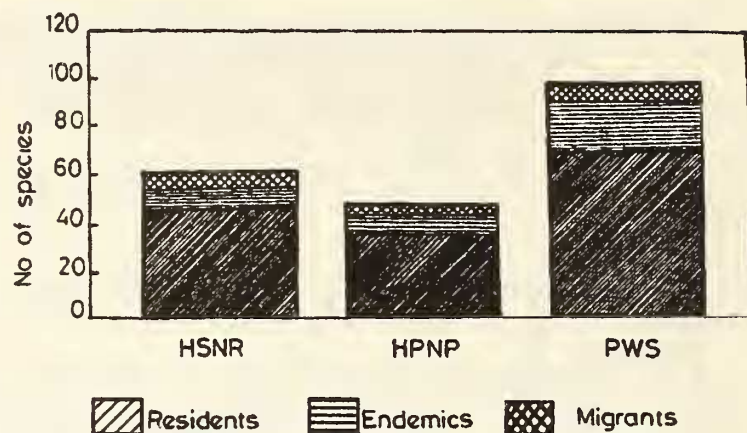


Fig. 2: Status comparison of avifauna at the study areas

(where bird species are concerned), was investigated using Jaccard's measure of estimating β diversity:

$$C_j = j/(a+b-j)$$

where j = the number of species found at both sites

a = the number of species in forest A

b = the number of species in forest B (Magurran 1988)

The different species of birds observed in the forests were divided according to their main feeding categories, under which food defined guilds were also recognized and separated. The proportion of birds in each feeding category and the proportion of birds in the main habitat types were calculated separately for each study area.

RESULTS

A total of 116 species belonging to 37 families were recorded from the three forests (App. II). These included 13 species of winter migrants and 23 species that are endemic to Sri Lanka. Fig. 2 shows a comparison of the status of the avifauna at the above forests. The total number of bird species observed at HSNR, HPNP and PWS were 61, 47 and 98 respectively. The proportions of endemic bird species recorded as a percentage of the total number of endemic bird species in Sri Lanka were as follows: HSNR 30%

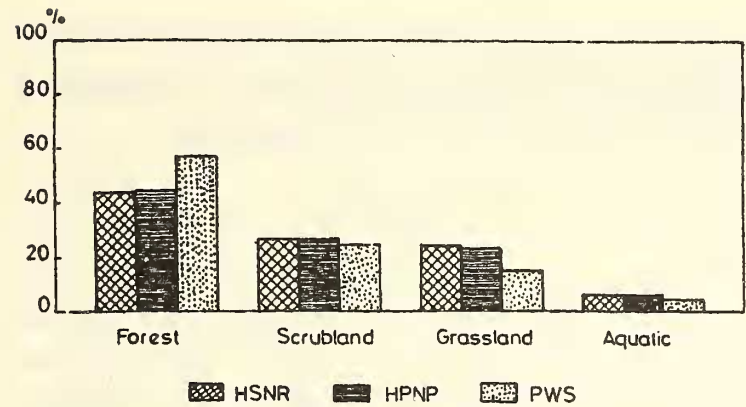


Fig. 3: Percentage habitat occupation of birds in the study areas

(8 species), HPNP 27% (7 species) and PWS 77% (20 species). The winter migrants arrived in late September.

Each study area consisted of four main habitat types — forests, scrublands, grasslands and aquatic habitats such as marshes, streams and ponds. Fig. 3 shows the percentage habitat occupation of birds in the three study areas. The habitat occupation of birds at HSNR and HPNP appears to be similar.

The mean number of species per trail at each study area included: HSNR 25.84 ± 4.81 (SD), HPNP 21.85 ± 5.11 and PWS 39.71 ± 12.89 (App. I). Table 1 shows the beta diversity measurements (Whittaker's index/Jaccard's index) for the three study areas. The higher values of Whittaker's index indicate a greater variation in species composition in a community,

TABLE 1 BETA DIVERSITY MEASUREMENTS			
Forest	HSNR	HPNP	PWS
Total no. of bird species	61	47	98
Mean no. of species per trail	25.84±4.81	21.85±5.11	39.71±12.89
Whittaker's measure	1.35	1.15	1.46
Forest pairs	HSNR & HPNP	HSNR & PWS	HPNP & PWS
Total no. of species common to each forest pair	41	47	36
Jaccard's measure	0.61	0.41	0.33

while higher values of Jaccard's index indicate greater similarity between bird communities in the two forests.

The species composition in the three study areas is clearly shown in Fig. 4. Forty nine (42.2%) bird species observed were exclusive to PWS, seven species (6.0%) were exclusive to HSNR and four species (3.4%) were exclusive to HPNP. Seven species were recorded only at HSNR and HPNP, two species were recorded only at HPNP and PWS, 13 species were recorded only at HSNR and PWS while 34 (29.3%) species were common to all three forests. Of the 49 species of birds exclusive to Peak Wilderness Sanctuary, 40 species occurred below 1500 m altitude.

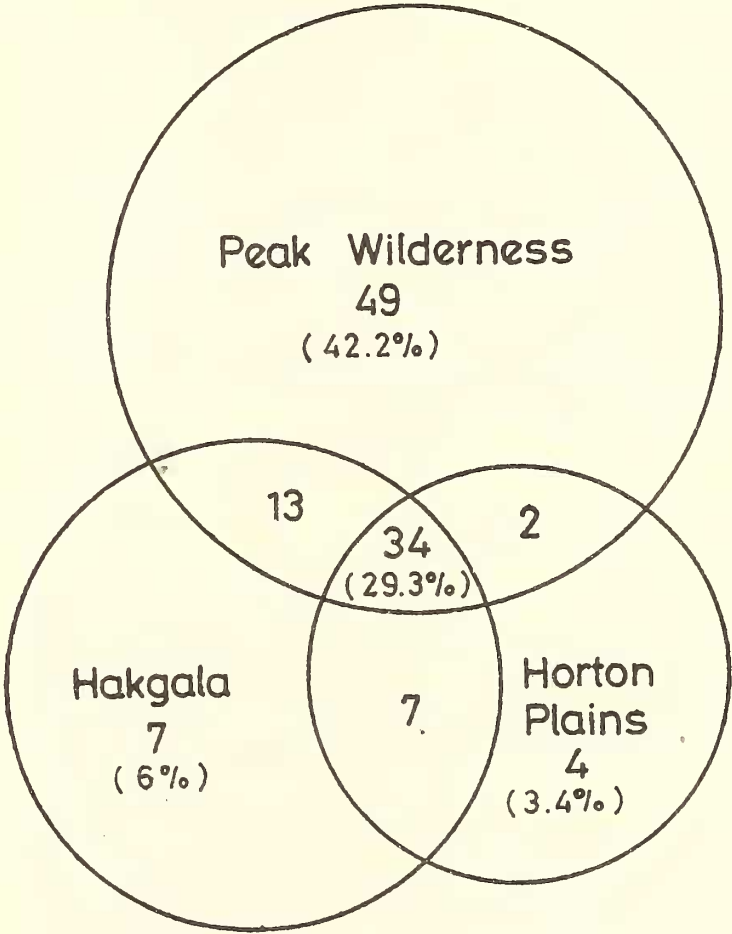


Fig. 4: Species composition of avifauna at the study areas. Showing the no. of exclusive and common species

Many species of birds were observed feeding in social groups (single species flocks and mixed species flocks). Mixed species foraging bird flocks was a common observation

TABLE 2
PROPORTION OF BIRD SPECIES OBSERVED
ACCORDING TO THEIR FEEDING GUILDS

Food category	No. of feeding guilds*	HSNR	HPNP	PWS
Insectivorous	06	35 (57.3%)	26 (55.3%)	44 (45%)
Carnivorous	03	7 (11.4%)	7 (14.8%)	11 (11.2%)
Phytophagous	04	10 (16.39%)	7 (14.89%)	25 (25.5%)
Omnivorous	04	9 (14.75%)	7 (14.89%)	18 (18.3%)

* Refer Appendix II for feeding guilds

at all three forests. Altogether, 35 species were observed participating in mixed flocks (App. II). Here, a single flock consisted of 4 to 20 different species with 10 to 60 individual birds. The lowland rainforest area of the Peak Wilderness Sanctuary harboured a higher number of flocks with mixed species as compared to the other areas. The different species of birds comprising the mixed flocks were distributed according to the vertical stratification of the vegetation.

The proportion of bird species according to four major feeding categories and the number of feeding guilds recognized under each feeding category is given in Table 2.

The insectivorous birds can be divided into six feeding guilds, based on their profitable/preferable feeding sites/niches. Similarly, carnivorous birds can be divided into three feeding guilds. The table shows that both HPNP and HSNR harbours a higher proportion of birds which feed on animal matter (approximately 70% insectivorous + carnivorous), compared to those at PWS (approximately 56%). Birds at the PWS occupy a considerable proportion of the phytophagous category (25%) (divided into four guilds) compared to those of the other two forests. However, the majority of the species from this category were found only in the lowland and sub-montane rain forest areas of the Peak Wilderness Sanctuary. A similar trend is seen in the omnivorous category (four guilds) where 19% of the birds at PWS belong to this category.

Appendix II provides a checklist of birds

for the three study areas along with their feeding guilds, habitats, habits (solitary, pairs, flocks, and mixed flocks) and feeding strategies.

DISCUSSION

With respect to the degree of change in species composition between the forests (β diversity - Whittaker's Index), the avifauna at PWS shows greater diversity and variation in comparison to the avifauna of the other two forests.

The main reason for this is likely to be the contiguous tracts of altitudinally graded forest, ranging from lowland rainforest to high altitude cloud forest. This is further evident when considering the percentage habitat occupation of birds in the three study areas. The percentage of birds occupying the forest habitats is highest at PWS (57%). The majority of bird species observed here were in the lowland rain forest area (50 m-700 m), which consists of a continuous 30-40 m high canopy, interspersed by taller individual emergents rising to about 60 m. The rich flora in the lowland rainforest creates additional habitats and food resources, and thereby harbours a diverse avifauna with many phytophagous species. The number of bird species observed gradually decreased along with increasing altitude. This may be due to the change in vegetation, food resources and cold climate at higher altitudes. The Jaccard's measure indicates that the avifaunal communities at HSNR and HPNP have a higher degree of similarity, compared to those at PWS and HPNP, and PWS and HSNR. Both HPNP and HSNR consist of montane cloud forest and montane grassland situated above 1650 m, and this may be the reason for the higher degree of similarity of avifauna in these two forests.

The food defined guild structure of the birds observed (Table 1, App. II) highlights the efficient distribution of food resources among different species in a community. It was evident that the different species of birds occupying a

particular feeding guild and space had evolved specialized feeding strategies to explore and obtain food resources efficiently and thereby reduce competition within a guild (App. II). For instance, of the arboreal insectivores occupying the canopy and sub-canopy, some were fast-flying, hawking (ie. Grey-headed flycatcher) while others were slow-flying, hawking (Azure blue flycatcher, Dusky blue flycatcher). Of the bark-gleaning insectivores in tree trunks, some chisel and drill into bark (woodpeckers), while others probe into lichens and mosses on tree trunks and into crevices (i.e. scimitar babbler, grey tit). These different feeding strategies are directly related to the structural adaptations of each species (i.e. structure of bill, legs and feet, wings etc.) Bird species which feed in flocks may have the advantage of finding food with ease and also protection. It was observed that birds which fed in social groups exploited food resources that were patchily distributed in both space and time (insects, seeds, fruit etc.), while most solitary feeders consumed well dispersed animal prey (amphibians, reptiles, mammals, snails, etc.). The majority of species in mixed flocks were insectivorous.

Of the total number of bird species observed in these three forests, 21 (19.5%) are considered as threatened in Sri Lanka (Wijesinghe *et al.* 1993). The Peak Wilderness Sanctuary, in particular, harbours the majority of the endemic and threatened bird species of Sri Lanka. These facts underline the importance of protecting these three forests in order to ensure the survival of these vulnerable bird species.

Finally, an aspect that was not examined during this survey was quantitative data on numbers of different species in a community, which would lead to the estimation of avifaunal diversity and relative abundance within each forest. We intend doing so in a future survey.

ACKNOWLEDGEMENTS

We thank Mrs. D.N. De Silva of the Department of Zoology, University of Peradeniya, for reviewing the manuscript, Mr. C. Jayewardena and Mr. J.H.B. Tennekoon for assisting in field observations, Mr. M. Chandrasekara for drawing the figures, and Miss C. Gregory for assistance.

REFERENCES

- HENRY, G.M. (1978): A Guide to the Birds of Ceylon. KVG de Silva & Sons, Kandy, Sri Lanka. pp 457.
- IUCN (1990): IUCN Directory of South Asian Protected Areas. IUCN, Gland, Switzerland. pp 294.
- JANSEN, M.A.B., S.W. KOTAGAMA, R.P. SUBASINGHE & P.B. KARUNARATNE (1986): Species composition and diversity of bird communities in two dry zone habitats. Abs. 42nd Ann. Sess. of the Sri Lanka Association for the Advancement of Science (SLAAS), Section D. pp 135.
- KOTAGAMA, S.W. & P. FERNANDO (1994): A field guide to the birds of Sri Lanka. Wildlife Heritage Trust of Sri Lanka, Colombo 8. pp 224.
- KOTAGAMA, S.W. & C.R. THAMBIAH (1986): Ecology, status and biology of avifauna at Sinharaja Rainforest. Sess. of the Sri Lanka Association for the Advancement of Science (SLAAS), Section D. pp. 136.
- MAGURRAN, A.E. (1988): Ecological diversity and its measurement. Croom Helm Ltd. London. pp 179.
- PHILLIPS, W.W.A. (1978): Annotated checklist of the birds of Ceylon. Wildlife and Nature Protection Society of Ceylon. pp 92.
- WERNER, W.L. & U. SCHWEINFURTH (1985): Naturreservate im Hochland der insel Ceylon (Sri Lanka): Peak Wilderness und Horton Plains. *Natur und Museum*. 115(3). Frankfurt.
- WIJESINGHE, D.P. (1994): Checklist of the birds of Sri Lanka. Ceylon Bird Club, Colombo 1: 30.
- WIJESINGHE, L.C.A DE S., I.A.U.N. GUNATILLEKE, S.D.G. JAYAWARDENA, S. KOTAGAMA & C.V.S. GUNATILLEKE (1993): Biological Conservation in Sri Lanka - A National Status Report. IUCN, Colombo 5, Sri Lanka. pp 100.

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix I

NUMBER OF BIRD SPECIES RECORDED IN DIFFERENT TRAILS

	Trail No.	Trail & length	Total number of birds observed	Number of new species observed	Cumulative total of species
HSNR	01	Licence bridge - Seetha Eliya - 2 km	21	21	21
	02	Kande Ela - Seetha Eliya - 1.5 km	28	11	32
	03	Hakgala Botanical gardens border - 1km	22	07	39
	04	Warwick Estate border - 1 km	22	04	43
	05	Ambewela NLDB farm border - 1 km	31	07	50
	06	Hakgala Peak trail - 1.5 km	24	02	52
	07	Kande Ela tank border - 1 km	33	09	61
			Mean no. of species per trail 25.85 ± 4.81 (SD)		
HPNP	01	Thotupolakande peak trail - 1.5 km	20	20	20
	02	Dayagama Road - 2 km	26	08	28
	03	Kirigalpotta peak trail - 4 km	30	09	37
	04	World's end trail - 1 km	18	01	38
	05	Wet montane grasslands - 1 km	15	02	40
	06	Grassland & forest edge - 1km	24	02	42
	07	Baker's Falls - 1.5 km	20	05	47
			Mean no. of species per trail 21.85 ± 5.11		
PWS	01	Eratne-Adam's Peak - 5 km	40	40	40
	02	Palabathdela - Adam's Peak - 8 km	51	18	58
	03	Hapugastenna - Adam's Peak - 7 km	52	20	78
	04	Belihul Oya - Ihala Galagama - 3 km	20	03	81
	05	Moray Estate - Adam's Peak - 4 km	30	06	87
	06	Maliboda - 2 km	32	03	90
	07	Mihiriyakotte-Waleboda - 5 km	53	08	98
			Mean no. of species per trail 39.71 ± 12.89		

Appendix II

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY AND THEIR HABITATS AND FEEDING ECOLOGY (Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
ABI F	Muscicapidae Dusky-blue flycatcher*+ <i>Eumyias sordida</i> (<i>Muscicapa</i>)	X	X	X	S, MF/ slow flying -hawking
F/S	Grey-headed flycatcher <i>Culicicapa ceylonensis</i>	X	X	X	P, F, MF/ fast flying- hawking

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
F/S	Orange-breasted blue flycatcher <i>Cyornis tickelliae</i>	-	-	X	S, MF/ hawking gleaning
F	Azure-blue flycatcher <i>Hypothymis azurea</i>	X	-	X	S, MF/fast flying- hawking
F/S	Whitebrowed fantail flycatcher <i>Rhipidura aureola</i>	X	-	-	S/slow flying hawking
F	Indian paradise flycatcher (WM) <i>Terpsiphone paradisi</i>	-	-	X	S/slow flying- hawking
F	Kashmir flycatcher (WM) <i>Ficedula subrubra</i> (<i>Muscicapa</i>)	X	-	-	S/snapping
F	Brown flycatcher (WM) <i>Muscicapa daurica</i>	X	-	X	S/snapping
F	Dicruridae Crested drongo <i>Dicrurus paradiseus</i>	-	-	X	P, MF/ diving & hawking
F/S	White vented drongo <i>Dicrurus caerulescens</i>	-	-	X	S, MF/diving & hawking
F	Trogonidae Trogon + <i>Harpactes fasciatus</i>	-	-	X	S, MF/slow flying, hawking
F/S	Caprimulgidae Highland nightjar <i>Caprimulgus indicus</i>	X	X	X	S/fast flying hawking
F/S	Lanidae Brown shrike (WM) <i>Lanius cristatus</i>	X	-	X	S/fly and pick
AI G/S	Apodidae Edible nest swiftlet <i>Collocalia unicolor</i>	X	X	X	F/gliding, hawking
G/S	House swift <i>Apus affinis</i>	-	-	X	F/gliding, hawking

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
F/S	Crested tree swift <i>Hemiprocne coronata</i>	-	-	X	S, P/gliding, hawking
F/S	Hirundinidae Hill swallow <i>Hirundo domicola</i>	X	X	X	F/gliding, hawking
G/S	Red-rumped swallow <i>Hirundo daurica</i>	-	-	X	F/gliding, hawking
G/S	East Asian swallow (WM) <i>Hirundo rustica</i>	X	X	X	F/gliding, hawking
F/G/S	Meropidae Chestnut-headed bee eater <i>Merops leschenaulti</i>	-	-	X	S, P/fast flying, hawking
FGI F/G/S	Muscicapidae Tailor bird <i>Orthotomus sutorius</i>	X	X	X	P, MF/gleaning
F	Large-billed leaf warbler (WM) <i>Phylloscopus magnirostris</i>	X	X	X	S/gleaning
F	Shama <i>Copsychus malabaricus</i>	-	-	X	S/glean, snap
F	Campephagidae Orange minivet <i>Pericrocotus flammeus</i>	X	X	X	P, F, MF/ gleaning
F	Little minivet <i>Pericrocotus cinnamomeus</i>	X	X	X	F, MF/ gleaning
F	Pied flycatcher shrike <i>Hemipus picatus</i>	X	X	X	F, MF/ gleaning
F/S	Irenidae Iora <i>Aegithina tiphia</i>	-	-	X	P/gleaning
BGI F	Sittidae Velvet fronted blue-nuthatch <i>Sitta frontalis</i>	X	X	X	F, MF/pecking, probing

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
F/G/S	Paridae Grey tit <i>Parus major</i>	X	X	X	P, F, MF/ probing
F	Picidae Red backed woodpecker <i>Dinopium benghalense</i>	-	-	X	P, MF/drilling, probing
F	Crimson-backed woodpecker <i>Chrysocolaptes lucidus</i>	X	X	X	P, MF/drilling, probing
F	Scaly bellied-green woodpecker+ <i>Picus xanthopygeus (myrmecophoneus)</i>	X	X	X	P/drilling , probing
F	Yellownaped woodpecker <i>Picus chlorolophus</i>	-	-	X	P/drilling, probing
F	Muscicapidae Scimitar babbler <i>Pomatorhinus horsfieldii</i>	X	X	X	P, F, MF/ probing
TI F/S	Muscicapidae Brown capped babbler* <i>Pellorneum fuscicapillum</i>	-	-	X	F/pick
F/S	Black fronted babbler <i>Rhopocichla atriceps</i>	X	X	X	F, MF/pick
F/G/S	White throated babbler <i>Dumetia hyperythra</i>	-	-	X	F/pick
F	Rufous babbler**+ <i>Turdoides rufescens</i>	-	X	X	F, MF/pick
F/G/S	Sri Lanka warbler**+ <i>Bradypterus palliseri</i>	X	X	X	P/pick
F	Spotted winged thrush**+ <i>Zoothera spiloptera</i>	-	-	X	S/pick
F/Aq	Arrenga**+ (Whistling thrush) <i>Myiophonus blighi</i>	X	-	-	S/pick

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
F/G/S	Blackbird <i>Turdus merula</i>	X	X	-	S/pick
F/G	Magpie robin <i>Copsychus saularis</i>	X	-	X	S/pick
F	Pied ground thrush (WM) <i>Zoothera wardii</i>	-	-	X	S/pick
F/S	Pittidae Indian pitta (WM) <i>Pitta brachyura</i>	-	-	X	S/pick
GI G/Aq	Charadriidae Red wattled lapwing <i>Vanellus indicus</i>	-	X	-	P/pick
G	Alaudidae Oriental skylark <i>Alauda gulgula</i>	X	X	-	P/pick
G/S	Indian pipit <i>Anthus rufulus</i>	X	X	-	S/pick
F/G/Aq	Motacillidae Grey wagtail (WM) <i>Motacilla cinerea</i>	X	X	X	S/pick
F/G	Yellow wagtail (WM) <i>Motacilla flava</i>	X	-	-	S/pick
G/S	Muscicapidae Pied bush chat <i>Saxicola caprata</i>	X	X	-	P/pick
G/S	Fan tailed warbler <i>Cisticola juncidis</i>	X	X	-	S/pick
G/S	Large prinia <i>Prinia sylvatica</i>	X	-	-	S/pick
G/S	White browed prinia <i>Prinia inornata</i>	X	-	X	S/pick

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
G/S	Ashy prinia <i>Prinia socialis</i>	X	-	X	S/pick
AC F/G/Aq	Accipitridae Black-winged kite <i>Elanus caeruleus</i>	X	X	X	S/hovering, diving
F/G	Serpent eagle <i>Spilornis cheela</i>	X	X	X	P/soaring, diving
F/G/S	Black eagle+ <i>Ictinaetus malayensis</i>	-	X	-	S/soaring, diving
F/G	Mountain hawk-eagle+ <i>Spizaetus nipalensis</i>	X	X	-	S/soaring, diving
F/G/Aq	Pale harrier (WM) <i>Circus macrourus</i>	-	X	-	S/soaring, diving
F/G/Aq	Marsh harrier (WM) <i>Circus aeruginosus</i>	-	X	-	S/soaring, diving
ATC F/G/S	Shikra <i>Accipiter badius</i>	-	-	X	S/fly, grab
F	Strigidae Jungle owlet <i>Glaucidium radiatum</i>	-	-	X	S/fly, grab
F/Aq	Fishing owl <i>Bubo zeylonensis</i>	-	-	X	S/fly, grab
F	Corvidae Sri Lanka blue magpie*+ <i>Urocissa ornata</i>	-	-	X	P, F/search, grab
G/Aq	Alcedinidae White-breasted kingfisher <i>Halcyon smyrnensis</i>	X	-	X	S/fly, pick
F/S	Cuculidae Common coucal <i>Centropus sinensis</i>	X	X	X	S/search, pick
F	Green billed coucal*+ <i>Centropus chlororhynchus</i>	-	-	X	S/search, pick

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
WC	Charadriidae				
Aq	Common sandpiper (WM) <i>Tringa hypoleucos</i>	X	-	-	S/walk, pick
	Ardeidae				
Aq	Pond heron <i>Ardeola grayii</i>	X	-	X	S/walk, pick
Aq	Little egret <i>Egretta garzetta</i>	-	-	X	S/walk, pick
AN	Nectariniidae				
F	Purple sunbird <i>Nectarinia asiatica</i>	X	X	X	P, MF/hover, suck nectar
F/S	Purplerumped-sunbird <i>Nectarinia zeylonica</i>	X	X	X	P/hover, suck nectar
F	Loten's sunbird <i>Nectarinia lotenia</i>	-	-	X	P/hover, suck nectar
AF	Sturnidae				
F	Common grackle <i>Gracula religiosa</i>	-	-	X	P, F/pluck
F	Sri Lanka grackle*+ <i>Gracula ptilogenys</i>	-	-	X	P, F, MF/pluck
	Columbidae				
F	Pompadour green pigeon <i>Treron pompadora</i>	-	-	X	F, MF/pluck
F	Green imperial pigeon <i>Ducula aenea</i>	-	-	X	P, F, MF/pluck
F	Sri Lanka wood pigeon*+ <i>Columba torringtoni</i>	X	X	-	S, P/pluck
	Dicaeidae				
F/S	Tickell's flowerpecker <i>Dicaeum erythrorhynchos</i>	X	X	X	P, F, MF/pluck
F	Legge's flowerpecker*+ <i>Dicaeum vincens</i>	-	-	X	P, F, MF/pluck

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
	Cuculidae				
F	Koel <i>Eudynamys scolopacea</i>	-	-	X	S/pluck
F	Red-faced malkoha*+ <i>Phaenicophaeus pyrrhocephalus</i>	-	-	X	S/pluck
	Capitonidae				
F	Brown-headed barbet <i>Megalaima zeylanica</i>	X	-	X	S, MF/pluck
F	Small barbet*+ <i>Megalaima rubricapilla</i>	-	-	X	S, MF/pluck
F	Yellow-fronted barbet* <i>Megalaima flavifrons</i>	-	-	X	S, MF/pluck
AFNGS	Psittacidae				
F	Layard's parakeet* <i>Psittacula calthorpae</i>	-	-	X	P, F, MF/pluck, gnaw
F	Rose-ringed parakeet <i>Psittacula krameri</i>	-	-	X	F/pluck, gnaw
F	Large parakeet <i>Psittacula eupatria</i>	-	-	X	F/pluck, gnaw
F	Blossom-headed parakeet <i>Psittacula cyanocephala</i>	-	-	X	F/pluck, gnaw
F	Sri Lanka lorikeet* <i>Loriculus beryllinus</i>	-	-	X	P, F, MF/pluck, gnaw
GS F/G/S	Columbidae				
	Spotted dove <i>Streptopelia chinensis</i>	X	X	X	P/pick
F/S	Bronze-winged pigeon <i>Chalcophaps indica</i>	-	X	X	S/pick
F/G	Blue-rock pigeon <i>Columba livia</i>	X	X	X	P, F/pick
	Ploceidae				
S/G	House sparrow <i>Passer domesticus</i>	X	-	X	P, F/pick

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
G	Spotted munia <i>Lonchura punctulata</i>	X	-	X	P, F/pick
G	White-backed munia <i>Lonchura striata</i>	-	-	X	P, F/pick
G	Hill munia*+ <i>Lonchura kelaarti</i>	X	-	-	P, F/pick
AFI F/S	Pycnonotidae Red-vented bulbul <i>Pycnonotus cafer</i>	X	X	X	P/Pick, catch
F	Black-capped bulbul* <i>Pycnonotus melanicterus</i>	-	-	X	F, MF/Pick, catch
F/S	Yellow-eared bulbul*+ <i>Pycnonotus penicillatus</i>	X	X	X	P, F, MF Pick, catch
F	Black bulbul <i>Hypsipetes leucocephalus</i>	X	X	X	P, F, MF/ Pick, catch
F	Yellow-browed bulbul <i>Hypsipetes indicus</i>	X	-	X	F, MF/Pick, catch
F	Bucerotidae Grey hornbill*+ <i>Ocyeros birostris</i>	-	-	X	S, P/Pick, pluck, catch
FGIFN F	Zosteropidae Hill white-eye* <i>Zosterops ceylonensis</i>	X	X	X	F, MF/Pick, glean, suck
F/S	Small white-eye <i>Zosterops palpebrosus</i>	X	-	X	F, MF/Pick, glean, suck
F	Irenidae Jerdon's chloropsis <i>Chloropsis cochinchinensis</i>	-	-	X	P, MF/Pick, glean, suck
F	Goldfronted chloropsis <i>Chloropsis aurifrons</i>	-	-	X	P/pick, glean, suck
F	Oriolidae Black headed oriole <i>Oriolus xanthornus</i>	-	-	X	S/pick, glean, suck

ECOLOGY OF AVIFAUNA IN HIGH ALTITUDE FORESTS OF SRI LANKA

Appendix II (contd.)

BIRD SPECIES OBSERVED AT THE HAKGALA SNR, HORTON PLAINS NP & PEAK WILDERNESS SANCTUARY
AND THEIR HABITATS AND FEEDING ECOLOGY
(Common names as provided by author - Ed.)

Feeding guild & habitat	Family Common name Scientific name	HSNR	HPNP	PWS	Habit/ Feeding Strategy
F	Sturnidae Whiteheaded starling*+ <i>Sturnus senex</i>	-	-	X	P, MF/pick, glean, suck
F	Campephagidae Large cuckoo shrike <i>Coracina macei</i>	-	-	X	S/pick, glean, suck
ATO F/G/S	Sturnidae Common mynah <i>Acridotheres tristis</i>	X	X	X	P, F/pick, catch
F/S	Corvidae Jungle crow <i>Corvus macrorhynchos</i>	X	X	X	P, F/pick, catch
TO F/S	Phasianidae Jungle fowl*+ <i>Gallus lafayetti</i>	X	X	X	S, F/scratch, pick
F/S	Turnicidae Bustard quail <i>Turnix suscitator</i>	-	-	X	S/scratch, pick
F/S	Muscicapidae Common babbler <i>Turdoides affinis</i>	-	-	X	F/probe, pick
Total	37 families, 116 species (23 endemics)	61	47	98	

HSNR - Hakgala Strict Nature Reserve

HPNP - Horton Plains National Park

PWS = Peak Wilderness Sanctuary

Feeding guild: ABI - Arboreal Insectivore, AI - Aerial Insectivore, FGI - Foliage Gleaning Insectivore, BGI - Bark-Gleaning Insectivore, TI - Terrestrial Insectivore, GI - Grassland Insectivore, AC - Aerial Carnivore, ATC - Arboreal-Terrestrial Carnivore, WC - Wading Carnivore, AN - Arboreal Nectarivore, AF - Arboreal Frugivore, AFNGS - Arboreal Frugivore, Nectarivore, Granivore, Seed-eater, GS - Granivore, Seed-eater, AFI - Arboreal Frugivore, Insectivore, FGIFN - Foliage Gleaning Insectivore, Frugivore, Nectarivore, ATO - Arboreal-Terrestrial Omnivore, TO - Terrestrial Omnivore.

Habitats: F - Forest; S - Scrub; G - Grassland;

Aq - Aquatic habitats (streams/ponds/marshes)

Status: * endemic species, + nationally threatened species WM - winter migrants.

Habit: S - solitary, P - pairs, F - flocks, MF - mixed species flocks.